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Document Description: Contract N68936-99-D-0030 Delivery Order 0004

☒ **This document has been released in its entirety.**

☐ **Portions of this document have been excised pursuant to the Freedom of Information Act. The applicable portion(s) excised and the exemption(s) applied are below indicated.**

- ☐ Exemption (b)(1) Information excised is properly and currently classified in the interest of national defense or foreign policy
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- ☐ Exemption (6)(9) Information excised is records containing geological and geophysical information (including maps) concerning wells.

Please direct inquiries regarding this document to:

Naval Air Warfare Center Weapons Division
Code K00000D (FOIA)
1 Administration Circle
China Lake, CA 93555-6100.

ORDER FOR SUPPLIES OR SERVICES

PAGE 1 OF 7

1. CONTRACT/PURCH. ORDER/ AGREEMENT NO.	2. DELIVERY ORDER/ CALL NO.	3. DATE OF ORDER/CALL	4. REQ./ PURCH. REQUEST NO.	5. PRIORITY
N68936-99-D-0030	0004	2003Jun05	0010062124	

6. ISSUED BY CODE N68936

CDR NAWCWD CODE 220000D
ATTN: B. MONCKTON
(760) 939-8234
1 ADMIN CIRCLE, BLDG 982
CHINA LAKE CA 93555-6100

7. ADMINISTERED BY CODE S0513A

DCMA SANTA ANA
34 CIVIC CENTER PLAZA
ROOM 813A
SANTA ANA CA 92701

8. DELIVERY FOB
[X] DEST
[ ] OTHER
(See Schedule if other)

9. CONTRACTOR CODE 08YH1 FACILITY

LOCKHEED MARTIN SERVICES INC
D.W SMITH
4151 N PECOS RD STE 207
LAS VEGAS NV 89115

10. DELIVER TO FOB POINT BY (Date) SEE SCHEDULE

11. MARK IF BUSINESS IS
[ ] SMALL
[ ] SMALL DISADVANTAGED
[ ] WOMEN-OWNED

12. DISCOUNT TERMS

13. MAIL INVOICES TO THE ADDRESS IN BLOCK
See Item 15

14. SHIP TO CODE N68936

CDR NAWCWD CODE 535D00D
DWAINE CAMPBELL / EW STUDY TECHNICAL POC
1 ADMIN CIRCLE
CHINA LAKE CA 93555-6100

15. PAYMENT WILL BE MADE BY CODE HQ0339

DFAS COLUMBUS CENTER WEO
WEST ENTITLEMENT OPERATIONS
PO BOX 182381 EFT: T
COLUMBUS OH 43218-2381

MARK ALL PACKAGES AND PAPERS WITH IDENTIFICATION NUMBERS IN BLOCKS 1 AND 2.

16. TYPE OF ORDER
DELIVERY/ CALL [X] — This delivery order/call is issued on another Govt. agency or in accordance with and subject to terms and conditions of above numbered contract.
PURCHASE [ ] — Reference your quote dated ____ Furnish the following on terms specified herein.

ACCEPTANCE. THE CONTRACTOR HEREBY ACCEPTS THE OFFER REPRESENTED BY THE NUMBERED PURCHASE ORDER AS IT MAY PREVIOUSLY HAVE BEEN OR IS NOW MODIFIED, SUBJECT TO ALL OF THE TERMS AND CONDITIONS SET FORTH, AND AGREES TO PERFORM THE SAME.

NAME OF CONTRACTOR | SIGNATURE | TYPED NAME AND TITLE | DATE SIGNED (YYYYMMMDD)

[X] If this box is marked, supplier must sign Acceptance and return the following number of copies: 1

17. ACCOUNTING AND APPROPRIATION DATA/ LOCAL USE
See Schedule

18. ITEM NO.	19. SCHEDULE OF SUPPLIES/ SERVICES	20. QUANTITY ORDERED/ ACCEPTED*	21. UNIT	22. UNIT PRICE	23. AMOUNT
	SEE SCHEDULE				

* *If quantity accepted by the Government is same as quantity ordered, indicate by X. If different, enter actual quantity accepted below quantity ordered and encircle*

24. UNITED STATES OF AMERICA
BY: THEODORE W FISKE — CONTRACTING / ORDERING OFFICER

25. TOTAL	$275,115.00
29. DIFFERENCES	
30. INITIALS	

26. QUANTITY IN COLUMN 20 HAS BEEN
[ ] INSPECTED [ ] RECEIVED [ ] ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS NOTED

DATE | SIGNATURE OF AUTHORIZED GOVT. REP.

27. SHIP NO. [ ] PARTIAL [ ] FINAL

28. DO VOUCHER NO.

31. PAYMENT [ ] COMPLETE [ ] PARTIAL [ ] FINAL

32. PAID BY

33. AMOUNT VERIFIED CORRECT FOR

34. CHECK NUMBER

35. BILL OF LADING NO.

36. I certify this account is correct and proper for payment.

DATE | SIGNATURE AND TITLE OF CERTIFYING OFFICER

37. RECEIVED AT	38. RECEIVED BY	39. DATE RECEIVED (YYYYMMMDD)	40. TOTAL CONTAINERS	41. S/R ACCOUNT NO.	42. S/R VOUCHER NO.

DD Form 1155, JAN 1998 (EG) PREVIOUS EDITION MAY BE USED.

SECTION A Solicitation/Contract Form

FOR YOUR INFORMATION: The following addresses and point of contacts are provided:

Name: William Monckton (Contract Specialist)
Phone: (760) 939-8234
DSN: 437-8234
FAX: (760) 939-8186
Email address: William.Monckton@navy.mil

Name: Rosie Vorwerk (COR)
Phone: (760) 939-0260
DSN: 437-0260
Email address: Rosemarie.vorwerk@navy.mil

Name: Dwaine Campbell (Technical POC)
Phone: (760) 939-0264
DSN: 437-0264
Email address: Dwaine.campbell@navy.mil

Name: Marge Vargus (Alt TPOC)
Phone: (760) 939-0283
DSN: 437-0283
Email address: Marjorie.vargus@navy.mil

This order incorporates the terms and conditions of the Basic Contract.

SECTION B Supplies or Services and Prices

ITEM NO	SUPPLIES/SERVICES	MAX QUANTITY	UNIT	UNIT PRICE	MAX AMOUNT
0001		1	Job	$	$ NTE

CES EW STUDY

CPAF - Provide Combat Environment Simulation EW Study in accordance with Statement of Work in Section C. This Order is being placed against CLIN 0005 of the Basic Contract.

This order is determined to be NONSEVERABLE.

Performance under this order may involve information up to the Security Classification SECRET in accordance with DD254 of Basic Contract.

MILSTRIP N0006002WXN0025

PURCHASE REQUEST NUMBER 0010062124

MAX COST	$
BASE FEE	$
SUBTOTAL MAX COST + BASE	$
MAX AWARD FEE	$
TOTAL MAX COST + FEE	$275,115.00

ACRN AA Funded Amount (Cost + Fee) $275,115.00

ITEM NO	SUPPLIES/SERVICES	MAX QUANTITY	UNIT	UNIT PRICE	MAX AMOUNT
0002		1	Job	$	$ NSP

Data - CDRL

CPAF - in accordance with Exhibit A, Contract Data Requirements List.

NSP - Not Separately Priced.

SECTION C Descriptions and Specifications

STATEMENT OF WORK (NONSEVERABLE)
EW Study For The Aircrew Electronic Warfare Training Ranges (AEWTR) Program

1.0 BACKGROUND:

The Aircrew Electronic Warfare Training Range (AEWTR) Project office at the Naval Air Systems Command Weapons Division (NASC-WD) China Lake has been designated lead field activity for Electronic Warfare (EW) in the development of the Aircrew Electronic Warfare Tactical Training Range (AEWTTR) project and is therefore responsible for the development, modification and sustainment of threat simulator systems for Naval Aircrew EW Tactical Training Ranges. This project involves upgrades to existing systems at the current AEWTTR facilities, development of new systems, and utilization of other DOD developed systems. The AN/GPQ-11(V) is a threat simulator radar system designed specifically for use on, and interface with, the Tactical Air Combat Training System (TACTS) at Navy aircrew training ranges. This SOW addresses the Electronic Warfare development and sustainment work required in support of the Naval Aircrew EW Tactical Training Ranges as provided under basic Combat Environment Simulation (CES) contract SOW.

2.0 APPLICABLE DOCUMENTS

The following documents are applicable in the performance of this SOW.

2.1 "Development Specification for the AN/GPQ-11(V) Threat Radar Simulator" DPITREWS-22-02C

2.2 "Interface Design Specification (IDS), Appendix 1 of the Development Specification for the AN/GPQ-11(V) Threat Radar Simulator" DPITREWS-22-02D

2.3 "Interface Design Document of the Navy Tactical Aircrew Combat Training System and the Air Force Air Combat Training System" NAWC TM 7920

2.4 Most current AEWTR Program Integrated Project Baseline (IPB)

3.0 REQUIREMENTS:

The purpose of the EW Study is to define the options and alternatives necessary to establish a rapid threat relocation and connectivity of current and future EW threat assets on Navy Tactical Training Ranges. The majority of the current EW threat assets are AN/GPQ-11(V) systems. Knowledge of these key technical interfaces and the technical methodologies are key to the performance of this study task.

The results of the study are needed for delivery to Commander Fleet Forces Command (CFFC) in his establishing future fleet training capabilities and methodologies. Present threat systems are currently connected on an EW Range through an aging architecture that is rapidly becoming unsupportable. Furthermore that current architecture does not readily support the rapid relocation of EW threats, that is needed to more accurately represent highly mobile, "shoot and scoot" threats and support training operations in non-traditional operational training locations.

The EW range that is currently hard-wired into a well-defined area is now transitioning into virtual EW range, comprised of clusters of mobile EW threats, which may be located up to hundreds of miles from a control point. A new architecture is required that is based on modern, open source, Commercial Off The Shelf (COTS) products that satisfy this new requirement. The contractor shall travel to various locations to gather required data for the study both at the Navy and Joint levels.

The following paragraphs call out the tasks and products required of the contractor. In all cases, the most current AEWTR GPQ-11(V) Program Integrated Program Baseline (IPB) with associated responsibilities and work levels shall apply (see Applicable Documents 2.1 thru 2.4)

3.1 **Electronic Warfare (EW) Study:**

3.1.1 The EW Study shall examine all technology areas, especially the AN/GPQ-11(V) interfaces that would enable the training ranges to rapidly relocate and reestablish connectivity and control of EW assets. The current architecture should be examined to ensure consistency with future training range operational concepts. The final product will be a report and a briefing (See 3.2.2).

3.1.2 The Contractor shall conduct a study to analyze the Commander Fleet Forces Command (CFFC) requirements for a new EW Range Architecture. Based upon those requirements, the contractor shall review current technology, review potential geographic deployment, determine bandwidths, requirements for data, voice and video; establish a common interface methodology for existing systems; determine latency of data solutions, propose mobility and connection methodologies, discuss data security and system security, consider the transition from the existing architecture to a new architecture without impacting training schedules, and tying all remote units to a central EW range control point or a satellite control point.

3.1.3 The proposed architecture shall consider the migration into the Test and Training Enabling Architecture (TEMS).

3.1.4 The proposed architecture shall use open source and COTS products to the maximum extent practical.

3.2 **Deliverables** (reports specified in Contract Data Requirements List):

3.2.1 Monthly reports are in accordance with CDRL A001. In support of this task order, the contractor shall deliver a monthly Cost, Schedule and Status Report (C/SSR) in accordance with CDRL A001. The Contractor will deliver a monthly status report that includes a summary of work performed, problems encountered, problems re solved, current schedules and information, including period and cumulative funds/hours expended. This monthly report will be provided to the Technical Coordinator no later than 10 working days following the end of the Contractor's monthly accounting period.

3.2.2 The Technical Study is in accordance with CDRL A002. The final deliverable will be a report and a briefing that includes a concepts of operations, implementation requirements, technical approaches and alternatives. The report and briefing shall present various options and alternatives for the "the way ahead for Navy / Joint EW tactical training ranges" and make recommendations. The briefing shall contain the same study results contained in its final report but with a briefing version/structure. The briefing shall be delivered in MS Power Point format.

4.0 OTHER CONSIDERATIONS

4.1 Performance Schedule: See Section F of Order.

4.2 Travel Estimate in accordance with Integrated Project Baseline.

4.3 Technical Coordinators:

Technical Coordinator
Dwaine Campbell
NASC-WD, China Lake, CA
(760) 939-0294
Dwaine.Campbell@navy.mil

Alternate Technical Coordinator
Marge Vargus
NASC-WD, China Lake, CA
(760) 939-0283
Marjorie.Vargus@navy.mil

SECTION E Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	Destination	Government	Destination	Government
0002	Destination	Government	Destination	Government

SECTION F Deliveries or Performance

DELIVERY INFORMATION

CLINS	DELIVERY DATE	UNIT OF ISSUE	QUANTITY	FOB	SHIP TO ADDRESS
0001	POP 09-JUN-03 TO 31-MAR-04	Job		Dest.	N68936 CDR NAWCWD CODE 535D00D DWAINE CAMPBELL / EW STUDY TECHNICAL POC 1 ADMIN CIRCLE CHINA LAKE CA 93555-6100
0002	POP 09-JUN-03 TO 15-APR-04	Job			I.a.w. CDRL

SECTION G Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AA:	97X4930 NH2C 252 77777 0 054219 2F 000000	A535A2EWS000
AMOUNT:	$275,115.00	

Submission of invoices/vouchers shall be in accordance with Section G of the contract.

SECTION J List of Documents, Exhibits and Other Attachments

Section J Table Of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit (A)	CES EW STUDY CDRL	2	APR-03-2003
Attachment (1)	Award Fee Calculation	1	MAY-27-2003
Attachment (2)	CES EW STUDY IPB	1	MAY-22-2003
Attachment (3)	Development Specification for the AN/GPQ-11(V) Threat Radar Emitter Simulator	30	JULY-18-1994

CONTRACT DATA REQUIREMENTS LIST
(1 Data Item)

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY: TDP TM OTHER:
N68936-99-D-0030/0004	**A**	

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
AEWTR	N68936-99-D-0029/30/31	Tybrin/Lockheed Martin/CTA

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A001	**Program Progress Report**	**Monthly Status Report**

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MGMT-80555	**SOW Para 4.3.1**	**NAWCWD 539500D**

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT	N/A	MTHLY	35 DARO
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
N/A		0	EOM+ 10 DAYS

Block 4: Tailor DID as follows: Contractor format authorized provided that the DID is used as a guideline.

Block 14: Submission of this report by electronic mail is preferable. Dwaine.Campbell@navy.mil and Rosemarie.Vorwerk@navy.mil.

Submit on magnetic media, format to be agreed upon between the Government and the Contractor prior to submittal of this data item.

/

14. DISTRIBUTION	b. COPIES		
a. ADDRESSEE	Draft	Final	
		Reg	Repro
NAWC: 539500D	**0**	**1**	**0**
NAWC: 2542000D	**0**	**1**	**0**
NAWC: 535D00D	**0**	**1**	**0**
15. TOTAL	**0**	**3**	**0**

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
Naval Air Warfare Center Weapons Division China Lake, CA 93555	04/03/03	Rosemarie D. Vorwerk	04/03/03

DD Form 1423-1, 1 Jun 9090

CONTRACT DATA REQUIREMENTS LIST
(1 Data Item)

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY: TDP TM OTHER:
N68936-99-D-0030/0004	**A**	

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
AEWTR	N68936-99-D-0029/30/1	Tybrin/LockheedMartin/CTA

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A002	**TECHNICAL REPORT-STUDY/SERVICES**	**EW Study Report**

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MISC-80508	**SOW Para 4.3.2**	**NAWCWD 539500D**

7. DD 250 REQ	9.DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT	SEE 16	ITIME	SEE BLOCK 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
N/A		N/A	SEE BLOCK 16

Block 4: Tailor DID as follows: Contractor format authorized provided that the DID is used as a guideline.

Block 12: Submit NLT 30 DA completion of tasking.

Block 14: Submission of this report by electronic mail is preferable. Dwaine.Campbell@navy.mil. Submit on magnetic media, format to be agreed upon between the Government and the Contractor prior to submittal of this data item.

14. DISTRIBUTION

a. ADDRESSEE	b. COPIES Draft	Final Reg	Final Repro
NAWC: 539500D	**0**	**See**	**16**
NAWC: 2542000D	**0**	**Ltr**	**Only**
NAWC: 535D00D	**0**	**Ltr**	**Only**
15. TOTAL →	**0**	**3**	**0**

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
Naval Air Warfare Center Weapons Division China Lake, CA 93555	04/03/03	Rosemarie D. Vorwerk	04/03/03

DD Form 1423-1, 1 Jun 9090

CES AWARD FEE
Contractor Fee Calculation WorkSheet
Prepared 27 May 2003

TASK ORDER: 0004 TASK ORDER TITLE: AEWTR EW Study

TOTAL AVAILABLE AWARD FEE: [ ]

AVAILABLE AWARD FEE ALLOCATION BY PERIOD:

PERIOD (6 mos each)	FROM *(date)*	TO *(date)*	PERCENTAGE OF TOTAL FEE	AVAILABLE AWARD FEE	*EVENT/MILESTONE TO SUCESSFULLY COMPLETE*
1	Date of Award	30-Sep-03	10%	[ ]	
2	01-Oct-03	31-Mar-04	90%	[ ]	
3					
4					
5					
6					
7					
6					
9					
10					
			100%	[ ] Total Award Fee Available	

Numbers in "PERCENTAGE OF TOTAL FEE" column must be integer numbers. Sum of "PERCENTAGE OF TOTAL FEE" column must equal 100.
If numbers in the "AVAILABLE FEE POOL" column are not integer numbers (whole dollars wihtout cents, those figures shall be truncated to whole dollars)

		AEWTR EW STUDY Integrated Project Baseline (IPB)					
		Applicable Document 2.3 (Plan as of 22 May 2003)					
ACTIVITY ID	**ACTIVITY TITLE**	**START**	**FINISH**	**GOVT HRS ESTIMATE**			
1.0	**EW Study**	01-Jun-03	31-Mar-04	**2,420**			
1.1	System Requirements Definition	01-Jun-03	01-Jun-03	480			
1.2	Researching	01-Jul-03	30-Sep-03	960			
1.3	Data Acquisition	01-Sep-03	31-Dec-03	540			
1.4	Documentation & Report	01-Nov-03	31-Mar-04	440			
	SUBTOTAL			**2,420**	**$238,460**		
3.0	**MATERIAL**				**$575**		
4.0	**TRAVEL**						
4.1	FY03	01-Jun-03	30-Sep-03	N/A			
4.2	FY04	01-Oct-03	31-Mar-04	N/A			
	SUBTOTAL			N/A	**$36,080**		
	TOTAL			**2,420**	**$275,115**		

DEVELOPMENT SPECIFICATION

for the

AN/GPQ-11(V)

THREAT RADAR EMITTER SIMULATOR

FINAL

Prepared for:

NAVAL AIR WARFARE CENTER - WEAPONS DIVISION
(NAWCWPNS)
China Lake, CA 93555-6001

Contract No. N60530-89-D-0050

Delivery Order 0017
CDRL AY02
CDRL Z002-A

Prepared by

Loral Space & Range Systems
AEWTR Program Office
1331 N Inyo St
Ridgecrest, CA. 93555

This document was prepared by the Loral Space & Range Systems (Loral) Aircrew Electronic Warfare Training Ranges (AEWTR) Program office staff. It has been approved by the following personnel:

John Polak
AEWTR Program Area Manager

Gary Jackson
System Engineeer

Kevin McIntyre
System Engineer

Jeannie Price
Associate Engineer

Steve Luhn
Range Programs QA

TABLE OF CONTENTS

LIST OF FIGURES

1.0 Scope

This specification establishes the equipment conceptual design and performance requirements for the Threat Radar Emitter Simulator (TRES).

2.0 Applicable Documents

2.1 Government Documents

The following documents form a part of this specification to the extent specified herein. Where the requirements of these documents conflict with the requirements of this specification, the requirements of this specification shall govern.

SPECIFICATIONS:

MIL-Q-9858A	08 Mar 85	Quality Program Requirements
MIL-F-14072C	01 Jun 86	Finishes for Ground Electronic Equipment
MIL-W-85G	20 Apr 76	Waveguides, Rigid, Rectangular

STANDARDS:

MIL-STD-129J	25 Sep 84	Marking for Shipping and Storage
MIL-STD-454K	29 Aug 86	General Requirements for Electronic Equipment
MIL-STD-461B	01 Apr 80	Electromagnetic Emissionand Susceptibility Requirements for Control of Electromagnetic Interference
MIL-STD-470A	03 Jan 83	Maintainability Program For Systems and Equipment
MIL-STD-785B	10 Sep 80	Reliability Program For System and Equipment Development and Production
MIL-STD-882B	30 Mar 84	System Safety Program Requirements
MIL-STD-1472C	10 May 84	Human Engineering Design Criteria
DOD-STD-1679A	22 Oct 83	Software Development
MIL-STD-756B	31 Aug 82	Reliability Modeling and Prediction
MIL-STD-781D	17 Oct 86	Reliability Testing for Engineering Development, Qualification, and Production

Copies of listed federal and military standards, specifications and handbooks are available through the DOD Single Stock Point, Commanding Officer, U.S. Naval

Publication and Forms Center (Attn: NPFC 1032), 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

2.2 Non-Government Documents

The following documents in effect on the date of Request For Proposal (RFP), form a part of this specification to the extent specified herein. Where the requirements of these documents conflict with the requirements of this specification, the requirements of this specification shall govern.

SPECIFICATIONS:

None.

3.0 Requirements

3.1 TRES Definition

A TRES shall be a single, unmanned, threat radar simulator that is capable of being remotely controlled from a central facility. TRES shall be designed to simulate threat radars on a signal emission only basis. A single TRES configuration shall be capable of simulating multiple threat radars as defined in Appendix II. For each simulated threat radar, the Target Track (TT) and Missile Guidance (MG) signals shall be fully and accurately simulated. The TRES concept has been derived from the requirement for additional threat density on Electronic Warfare (EW) training ranges. The keys to fulfilling this requirement are simulation fidelity, reliability, and affordability. Commercial component usage is encouraged where it can be demonstrated that environmental, reliability, and performance requirements are not compromised as a result.

3.1.1 Functional Description

Each TRES shall consist of five functional groups. These are the control and display subsystem, the Radio Frequency (RF) emission subsystem, the antenna beam pointing subsystem, a diesel generator (if required), and the enclosure(s) as required. These are functional groups but can be physically integrated units for design practicality. All TRES subsystems and components shall be designed for maximum commonality.

3.1.2 Threat Data

The identification of specific threats to be simulated along with their emitter characteristics are classified and are contained in Appendix II of this specification.

3.1.3 TRES Diagrams

Figure 3-1 is a functional block diagram of a TRES. Figure 3-2 shows a typical TRES deployment.

3.2 Operational Concept

The TRES units shall be deployed on EW ranges used primarily for training aircrews to recognize and counter air defense threats while performing strike missions. Multiple TRES's will be deployed in conjunction with existing manned threats to provide threat density and diversity during aircrew EW training. Each TRES shall be capable of implementing the threat air defense doctrine via control inputs.

3.2.1 Operational Requirements

Each TRES shall accurately simulate the emission parameters of the designated threats to stimulate the EW systems onboard training aircraft. This accurate simulation shall require full Effective Radiated Power (ERP) for each threat TT and MG transmitter. TT transmitters shall require accurate frequency, Pulse Width (PW), and Pulse Repitition Frequency (PRF) parameters. MG transmitters shall require accurate simulation including both Missile Alert (MA), and Missile Launch (ML) formats when appropriate. The TRES shall be capable of remote or local operation.

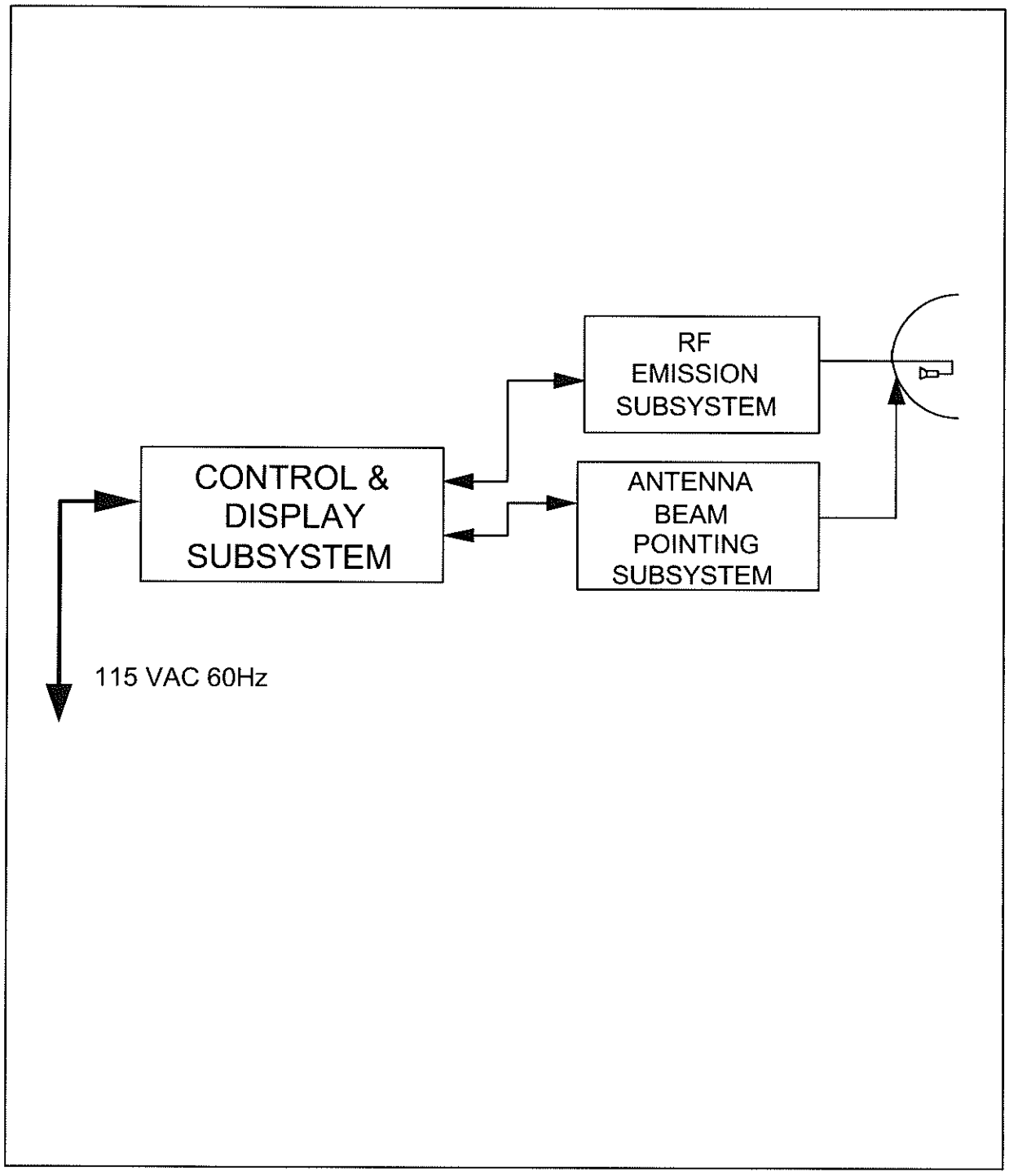


Figure 3-1 TRES Functional Block Diagram

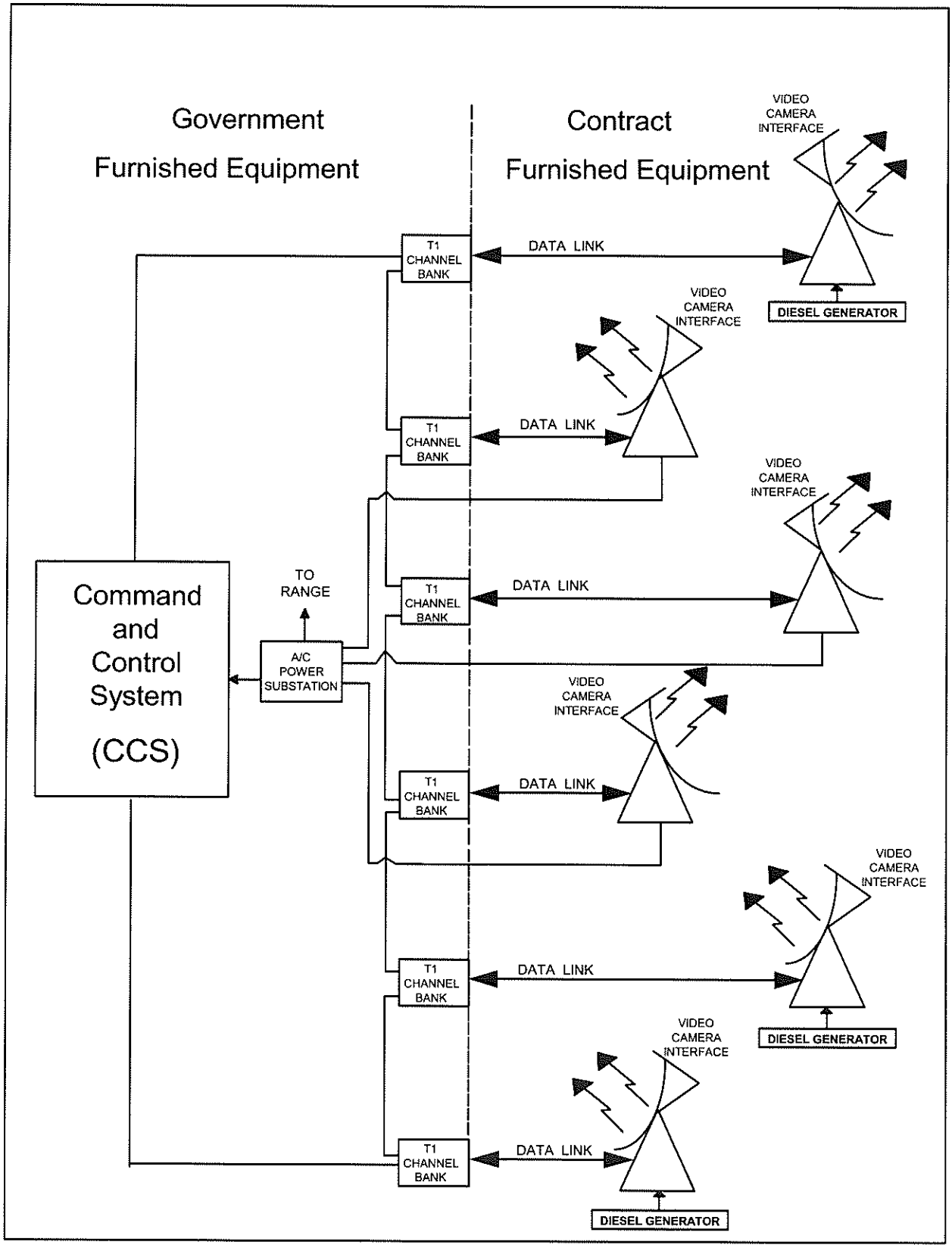


Figure 3-2 Typical TRES Deployment

3.2.1.1 Setup

The TRES System shall be capable of local and remote turn on and check-out. Following power up and check-out, each TRES parameter can be set up for the specific threat to be simulated. Setup will involve selecting the PW and PRF parameters, ERP, scan simulation, and MG simulation to correspond to a threat within the configurations specified in Appendix II.

3.2.1.2 Operation

After setup, the TRES shall provide the capability to implement the adversary air defense doctrine of the threat being simulated.

3.2.1.3 Faults

The TRES shall provide fault monitoring so that the local or remote operator can monitor status. This fault monitoring shall require faults to be monitored in realtime.

3.3 Common Requirements

Within each functional group are a set of common requirements. These requirements shall be applied to all hardware to be delivered. The foremost common requirements are commonality and self protection features. With the exception of the RF Emission Subsystem, the TRES shall be common to the maximum extent possible. The TRES shall not suffer damage from any direct controls or commands.

3.3.1 Internal Interfaces

All internal TRES power, signal, and control interfaces shall be integral to the TRES. The TRES shall be designed using a VME bus architecture which shall contain, as a minimum, two expansion slots. All interfaces, including those between subsystems, shall be common; independent of TRES configuration.

3.3.2 Power

All TRES hardware shall operate off standard 120 Volts Alternating Current (VAC), 3 Phase, 60 Hertz (Hz) commercial power. Power regulation at the input to the TRES for the commercial power will be between +10% and -15% in voltage and +/-10% in frequency. TRES Systems shall also have the capability to operate using a diesel generator. The minimum generator capability shall require startup, fault monitoring, and shut down.

3.3.3 Transport and Setup

The TRES shall be transportable over public highways and unimproved roads on a flatbed truck, without requiring permits for wide or high loads. The equipment shall withstand vibration and shock induced during transport. The System and all components heavier than one man lift, shall include lifting eyes. TRES shall be designed to be erected using ordinary hand tools, and a forklift or crane. TRES shall be compatable and positionable with a standard forklift.

3.3.4 System Illumination

Illumination shall be provided for system controls, indicators, and displays to permit operation during periods of darkness.

3.3.5 Indicator Visibility

Operating controls and indicators shall be visible in bright sunlight at a minimum distance of 24 inches from the eye.

3.4 Control and Display Subsystem.

The Control and Display Subsystem is the functional control center of each TRES. This subsystem contains all external electrical interfaces, the man-machine interface, and all processing equipment.

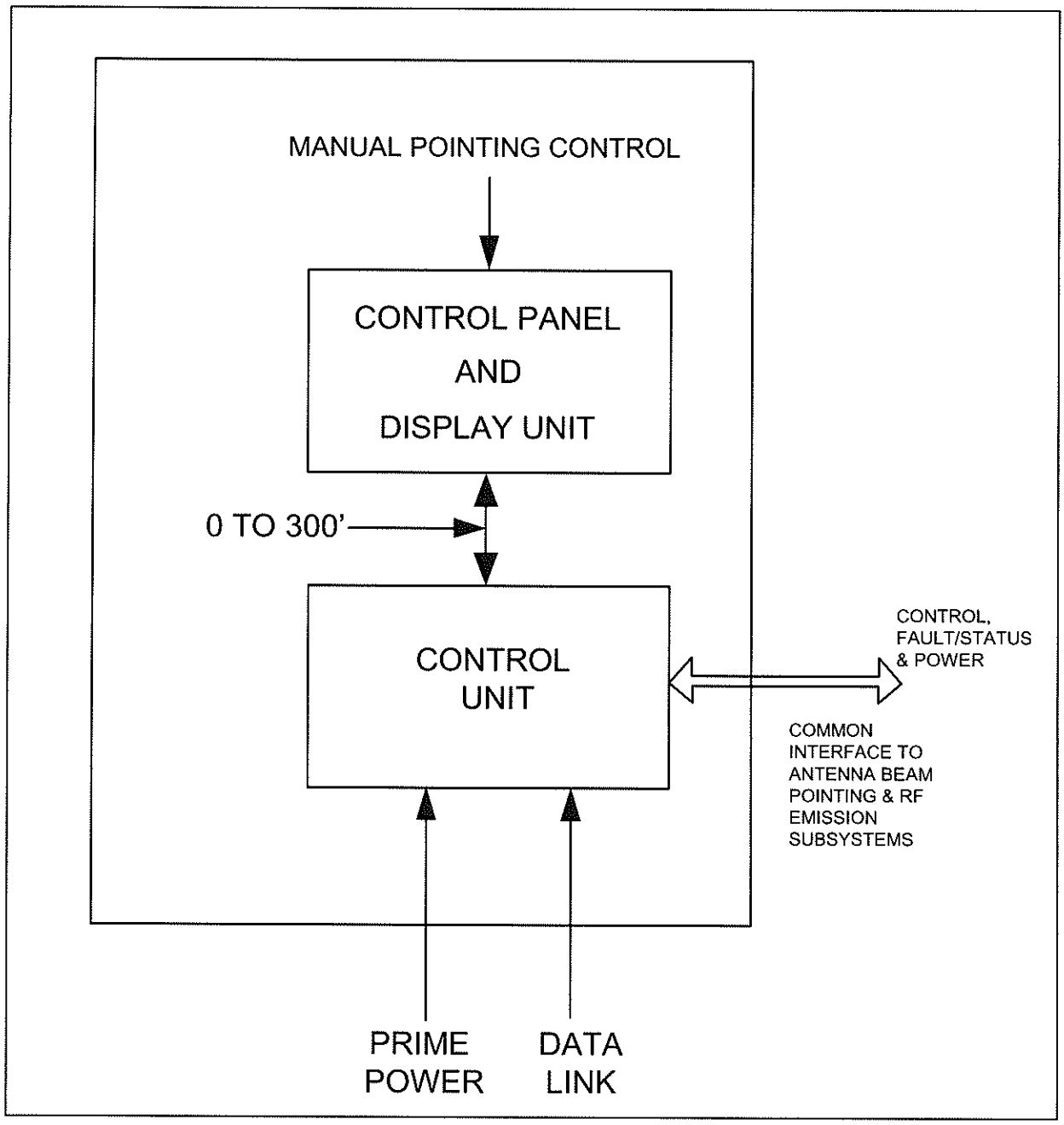
3.4.1 Characteristics

Each TRES shall be designed to have almost identical remote and local operating capabilities. The Control and Display Subsystem shall be identical to the extent possible; independent of the specific threat configuration of the TRES System. The Control and Display Subsystem is comprised of two major elements, these are the Control Unit, and the Control Panel and Display. Figure 3-3 is a functional block diagram of the Control and Display Subsystem.

3.4.2 Control Panel and Display Unit

The Control Panel and Display Unit is the local man-machine interface to the TRES.This man-machine interface shall be capable of being located at the TRES or anywhere within 300 feet of the TRES. The Control Panel and Display Unit is easily detachable and removable from the TRES; and will support future video tracking requirements. Video tracking is a preplanned equipment improvement program, and the Control Panel and Display shall be designed to support this future requirement. The Control Panel and Display Unit is comprised of the setup controls and displays, operational controls and displays, fault monitors, and the manual pointing control. The Control Panel and Display Unit shall have identical functional control capability as the remote interface specified in Appendix I, with a few exceptions for setup controls as noted.

Figure 3-3 Control and Display Subsystem



3.4.2.1 Setup Controls

The setup controls consist of basic controls and additional controls that allow the TRES to simulate each threat within the configurations specified in Appendix II. The basic setup controls include data rates, interface modes, etcetera. The setup controls that make the TRES a specific threat simulator include the ERP, the PW, the PRFs, the MG simulation, etcetera. The method for implementing these functions, is through discrete controls as described below and in Appendix I. The actual method employed is non-critical so long as individual parametric programming and simulation of multiple threats within a configuration can be maintained. The minimum setup controls and their functions are as follows:

a. Master Power On - This control is a local only control that enables/disables the data link receive only mode.

b. Power On/Generator Start - This control shall apply power to the TRES Platform from the Power Distribution System, or the diesel generator if so equipped. This control shall operate only if the master power control is On.

c. Power Off/Generator Stop - This control shall remove power to the TRES platform from the power distribution system, or the diesel generator if so equipped.

d. Local/Remote - This control enables either the local or remote control of the TRES platform. (See Note 1.)

e. Data Rate - This control allows selection of data rates for the serial remote interface of 9.6 kbps, 19.2 kbps, 38.4 kbps. (See Note 1.)

f. Pulse Width - This control selects the PW to be output by the TT transmitter.

g. PRF1 Stable - This control selects the discrete PRF to be output by the TT transmitter during stable operation when PRF1 is selected. (See Note 2.)

h. PRF2 Stable - This control selects the discrete PRF to be output by the TT transmitter during stable operation when PRF2 is selected.(See Note 2.)

i. PRF1 Stagger - This control selects the stagger PRF values to be output by the TT transmitter during stagger operation when PRF1 is selected. The stagger shall be implemented by outputting the values for PRF1 Stagger. There shall be up to discrete values available for PRF1 Stagger. (See Note 2.)

j. PRF2 Stagger - This control selects the stagger PRF values to be output by the TT transmitter during stagger operation when PRF2 is selected. The stagger shall be implemented by outputting the values for PRF2 Stagger. There shall be up to sixteen discrete values available for PRF2 Stagger. (See Note 2.)

k. Scan - This control selects the scan simulation to be applied to the TT transmitter output. The Scan simulation waveforms are programmed in non-volatile memory and are selected using this control. Specific scan parameters are provided in Appendix II.

l. TT ERP - This control selects the ERP output of the TT transmitter to simulate the ERP of various threats. The ERP requirements are specified in Appendix II. (See Note 2)

m. Missile Guidance - This control selects the MG simulation to be output when MG commands are activated. MG simulation in some cases also controls MG ERP as well as waveform characteristics. The MG simulation is preprogrammed into non-volatile memory and accessed using this control.

Note 1: These controls are only available locally at the TRES platform.

Note 2: Parameter programming shall default to available range for a given configuration.

3.4.2.1.1 Setup Displays

Setup displays shall be provided that allow setup to be easily determined, and to provide positive entry indications during TRES setup.

3.4.2.1.1.1 Duty Cycle Error Checks

Duty cycle errors shall be determined during programming and shall activate an error tone and display. The duty cycle error shall be calculated using long term duty cycle limits so that a sequence of five stagger PRF values can be entered which could discretely appear as over duty values.

3.4.2.2 Operating Controls.

Operating controls are those controls required for operation of each TRES System to implement the threat air defense doctrine. Each of these controls is also available through the use of the external data link interface specified in Appendix I. The controls shall be functionally grouped together. The minimum operating controls and their functions are as follows.

a. TT Transmitter Power On - This control applies power to the TT. After any required time-out interval, the TT transmitter shall go to the standby state.

b. TT Transmitter Power Off - This control removes power from the TT.

c. MG Transmitter Power On - This control applies power to the MG. After any required time-out interval, the MG transmitter shall go to the standby state.

d. MG Transmitter Power Off - This control removes power from the MG RF unit.

e. Pedestal On - Applies prime power to the antenna pedestal.

f. Pedestal Off - Removes prime power from the antenna pedestal.

g. Slaving On - This control causes the antenna pedestal to respond to external slaving commands received across the interface defined in Appendix I.

h. Slaving Off - This control causes the antenna pedestal to disregard external slaving commands received across the interface defined in Appendix I.

i. Joystick On - This control activates the manual pointing device

j. TT Transmitter Radiate - Causes the TT transmitter to radiate within 6 seconds.

k. TT Transmitter Standby - Causes the TT transmitter to stop radiating within 6 seconds.

l. MG Transmitter Radiate - This control causes MG transmitters to begin radiating (or in complex MG cases to initiate radiation of programmed simulation) within 6 seconds. Depending upon the specific TRES configuration and the threat being simulated, this could be a set of controls to allow discrete MG functional control.

m. MG Transmitter Standby - This control causes the MG transmitter to stop radiating within 6 seconds.

n. TT Transmitter PRF1 - This control selects the PRF entered for PRF1 When transmitting, this command shall cause PRF1 to be output.

o. TT Transmitter PRF2 - This control selects the PRF entered for PRF2. When transmitting, this command shall cause PRF2 to be output.

p. Stable - This control selects stable PRF mode (using PRF1 or PRF2 as selected above). When transmitting, this command shall cause the stable mode to be output.

q. Stagger - This control selects staggered PRF mode (using PRF1 stagger or PRF2 stagger as programmed above). When transmitting, this command shall cause the stagger mode to be output.

r. Launch Relay Arm - This control causes a normally open, external relay with a contact rating of 250VAC, 1A, to be closed for 1 second within 1 second.

s. TT Dummy Load In - This control switches the TT dummy load into the waveguide path and disables the TT transmitter from radiating in free space.

t. TT Dummy Load Out - This control switches the TT dummy load out of the waveguide path.

u. MG Dummy Load In - This control switches the MG dummy load into the waveguide path and disables the MG transmitter from radiating in free space.

v. MG Dummy Load Out - This control switches the MG dummy load out of the waveguide path.

3.4.2.2.1 Operating Displays

Operating displays shall be provided to allow current configuration to be easily determined, and to provide positive entry indications during TRES operation. In addition, the following local operating displays shall be provided.

a. Pedestal AZ and EL Command digital display $\pm$.01°. This display shall indicate the commanded pedestal position when operating in any slaving mode.

b. Pedestal AZ and EL Position digital display $\pm$.01°. This display shall indicate the actual pedestal position when operating in any slaving mode.

3.4.2.3 Fault Monitors

The control and display panel shall display faults that will be defined in variant specific Configuration Item Development Specifications.

3.4.2.4 Manual Pointing Control

The Control Panel and Display Unit shall have a rated manual pointing control that is suitable for static positioning and video tracking applications. The initial use of the manual pointing control shall be static positioning during maintenance and checkout procedures.

3.4.3 Control Unit

The Control Unit (CU) shall be required to implement all of the functions on the Control Panel and Display Unit in addition to the interface with the Control Facility (CF). This shall include a receive only mode so that after power down, the TRES maintains a data link receive only status to facilitate remote operation. To implement all of these functions, the CU shall require onboard processing, external interfaces, PRF, waveform and trigger generators, and maintenance displays.

3.4.3.1 On Board Processing

The CU shall have onboard processing using a VME bus architecture. The onboard processing shall be required to implement a data link only mode. This mode shall maintain a minimum amount of the TRES hardware energized to allow remote startup of the TRES. The data link only mode shall operate in conjunction with the setup controls a, b, and c, referenced in Section 3.4.2.1.

3.4.3.2 External Interfaces

The CU shall contain TRES external interfaces. These interfaces are in addition to the detachable Control Panel and Display Unit and are the prime power, data link, and launch relay.

3.4.3.2.1 Prime Power

The CU shall be the physical location for the input and distribution of prime power.

3.4.3.2.2 Data Link

The data link shall be input and terminated in the CU and have the identical functional capability to control the TRES as the Control Panel and Display Unit specified above. The data link is the remote interface to the TRES and is specified in detail in Appendix I. While operating in the remote mode, the CU shall automatically shut down the TRES (to receive only mode) after thirty minutes of continuous data link failure.

3.4.3.2.3 Launch Relay

There shall be a Launch Relay internal to the CU with both contact leads routed to an external connector. The contacts shall be electronically isolated from the CU and normally open. Contact rating shall be a minimum of 1A, 250VAC.

3.4.3.3 PRF, Waveform and Sub-Trigger Generator

The CU shall contain the PRF, waveform, and trigger generators for the TT and MG transmitters. These signal generators will be used for generating the PRFs for the TT and MG transmitters, the waveforms for the scan simulations, and the triggers for timing. Although specified functionally, these units may be combined into one device and may be combined with the RF emission subsystem for design practicality.

3.4.3.3.1 TT PRF Generator

The TT PRF generator shall be capable of generating PRFs for the stable and stagger modes of the TT transmitter. The PRF generator shall have a metric crystal of the value specified in Appendix II for the threats to be simulated. The PRF generator shall be capable of generating PRFs as specified in Appendix II, or shall default to the programming range for each TRES configuration. For simulation accuracy, the PRF generator shall be selectable in integer multiples (divide by N) of the Pulse Repetition Interval (PRI) clock as specified in Appendix II . The PRF generator shall generate all required triggers for TT transmitters operation. The TT PRF generator shall have external input and output ports to facilitate future growth requirements.

3.4.3.3.2 MG PRF Generator

The MG PRF generator shall be capable of generating the pulse trains and control signals required for the MG simulation. The MG PRF generation shall be derived from the same physical and electrical clock as specified above. The MG PRF generator shall be capable of generating all required external triggers to the MG transmitter. MG waveform characteristics are provided in Appendix II. MG simulation shall be accessed via the setup controls specified in Section 3.4.2.1.

3.4.3.3.3 Sub-Trigger Generator

The PRF generator shall have a Sub-Trigger generator to produce the triggers necessary for the synchronizing of the MG transmitter with the TT transmitter when required by Appendix II. The MG and TT waveforms shall be derived from the same source and the timing shall be closely controlled as specified in Appendix II. There shall be one generator that will support all MG sub-trigger configurations. The sub-trigger generator shall provide all internal synchronization between transmitters.

3.4.3.3.4 Waveform Generator

The CU shall control the amplitude modulation of the TT signal to provide scan simulation. This shall require a waveform generator that can generate the control signals required for scan simulations as specified in Appendix II. The data for the scan signals shall be preprogrammed into the waveform generator in a non-volatile memory device. Scans shall be accessed as specified in Section 3.4.2.1, Setup Controls.

3.4.3.4 Maintenance Displays

The CU shall display the following Status Functions:

a. CU Operation Time (in hours)

b. Power Supply Voltage On

c. Power On

3.5 RF Emission Subsystem

The RF Emission subsystem consists of the transmitters, the transmission line components, and the antenna(s). This subsystem is the changeable element of the TRES System that allows the basic TRES to be configured to simulate a variety of threat radars.

3.5.1 Transmitters

The TRES CU shall be able to determine configuration and parameter ranges (e.g. duty cycle limits, PRF range, etcetera), to facilitate setup and operation. Transmitters shall be designed to automatically shutdown for any reason prior to suffering damage.

3.5.1.1 Emitter Parameters

Each TRES shall be capable of accurately simulating the emissions specified in Appendix II.

3.5.1.2 Transmitter Tubes

Transmitter tubes shall be selected as off-the-shelf items. Transmitter tubes shall be selected based upon affordability, the most applicable technology, and the requirements specified in Appendix II.

3.5.1.3 Transmitter Modulator

Specific attention shall be paid to maximum reliability in the design and selection of modulators.

3.5.1.3.1 TT Transmitters

TT modulators shall operate as specified in Appendix II for each configuration. TT transmitter shall provide self protection in event of a modulator fault condition.

3.5.1.3.2 MG Transmitters

MG transmitters will consist of a mix of Continuous Wave (CW) and modulated devices as required and specified in Appendix II. The modulator shall be designed for maximum reliability. MG transmitter performance characteristics are specified in Appendix II. MG transmitter shall provide self protection in event of a modulator fault condition.

3.5.1.4 High Voltage Units

The High Voltage Power Supply (HVPS) for the TT and MG transmitters shall be designed for high reliability and ease of maintenance.

3.5.1.5 Growth

Each transmitter shall include a 120VAC, 60Hz, 325W outlet for future requirements.

3.5.1.6 Controls and Metering

The transmitter shall have, at a minimum, the controls necessary to adjust filament, high voltage levels, and the capability to locally adjust the transmitter RF frequency. Also, the TT and MG transmitter metering shall display, as a minimum the following circuits status on the transmitter control panel:

a. Transmitter Tube Filament Voltage

b. Transmitter Tube Current to include helix or body current if a linear beam tube is used.

c. High Voltage

d. Modulator Current

e. Tube Filament Running Time (in hours)

f. Tube Radiate Time (in hours)

3.5.2 Transmission Line Components

All microwave components employed shall be capable of handling the full power level of the transmitter. The transmission line components shall include waveguide, a modulator, a dummy load, Waveguide Pressurization and Dehydration subsystem, and potentially an isolator.

3.5.2.1 Waveguides and Related Equipment

All waveguides and related equipment shall be commercially available sizes and be manufactured In Accordance With (IAW) MIL-W-85G. Waveguide selection shall be evaluated to allow both the MG and TT signals to be carried by means of diplexing. As a goal, the waveguide and transmission line components shall be designed to achieve a zero leak rate.

3.5.2.2 Scan Modulator

TRES configurations requiring scan simulation as defined in Appendix II shall use amplitude modulation to simulate the scan.

3.5.2.3 Isolators

Isolators may be employed between the output stage of the transmitter and the antenna if the waveguide and related components present a Voltage Standing Wave Ratio (VSWR) of greater than 1.3:1 to the transmitter anywhere across the band. If required, the isolator shall be selected and located to present a maximum VSWR of 1.3:1 to the tube.

3.5.2.4 Dummy Load

Dummy load(s) shall be provided that can dissipate the full peak and average power of the transmitters. This shall include both the TT and MG transmitters.

3.5.2.5 Rotary Joint(s)

Rotary joint(s) if employed, shall be selected to minimize VSWR and air pressure leakage. Rotary joint(s) shall be capable of handling the full average and peak power of the transmitter(s).

3.5.2.6 Waveguide Pressurization and Dehydration Subsystem

A Waveguide Pressure and Dehydration Subsystem shall be provided. Waveguide and reservoir pressure shall be automatically regulated and displayed on gauges. The compressor shall be vibration isolated from the other TRES components.

3.5.3 Antennas

Each TRES System shall use a single parabolic antenna whenever possible to radiate the TT and MG signals. The antennas shall be chosen in conjunction with the transmitters so that the beam width is maximized at full ERP to minimize pointing considerations. The minimum acceptable azimuth or elevation beam width for any TRES configuration is 1.4°. Antenna sidelobes are not critical.

3.6 Antenna Beam Pointing Subsystem

The Antenna Beam Pointing Subsystem shall respond to the Pointing Command as specified. This subsystem is critical to the TRES concept because the beam must constantly illuminate the training aircraft. Each TRES will engage a single aircraft. The Antenna Beam Pointing Subsystem contains the pedestal, servos, and control circuitry

to point the beam. Figure 3-4 is a functional diagram of the Antenna Beam Pointing Subsystem.

3.6.1 Pedestal Systems

Each TRES shall have only one pedestal. It shall be configured for dual axis (Azimuth (AZ) and Elevation (EL)) operation and control. The antenna pedestal shall use a slip ring package for transfer of non RF signals. Antenna pedestals shall be inhibited from operations which would cause damage from direct commands. Minimum pedestal parameters are as follows:

Drive Type	Elevation over Azimuth
Slew Range AZ	360° continuous
Slew Range El	-5 to 85°
AZ Minimum Velocity	45°/s
EL Minimum Velocity	30°/s
Minimum Acceleration AZ and El	$30°/s^2$
Operational Wind Loading	50 knots
Operational Ice Loading	1/4 inch
Non Operational Winds	100 knots

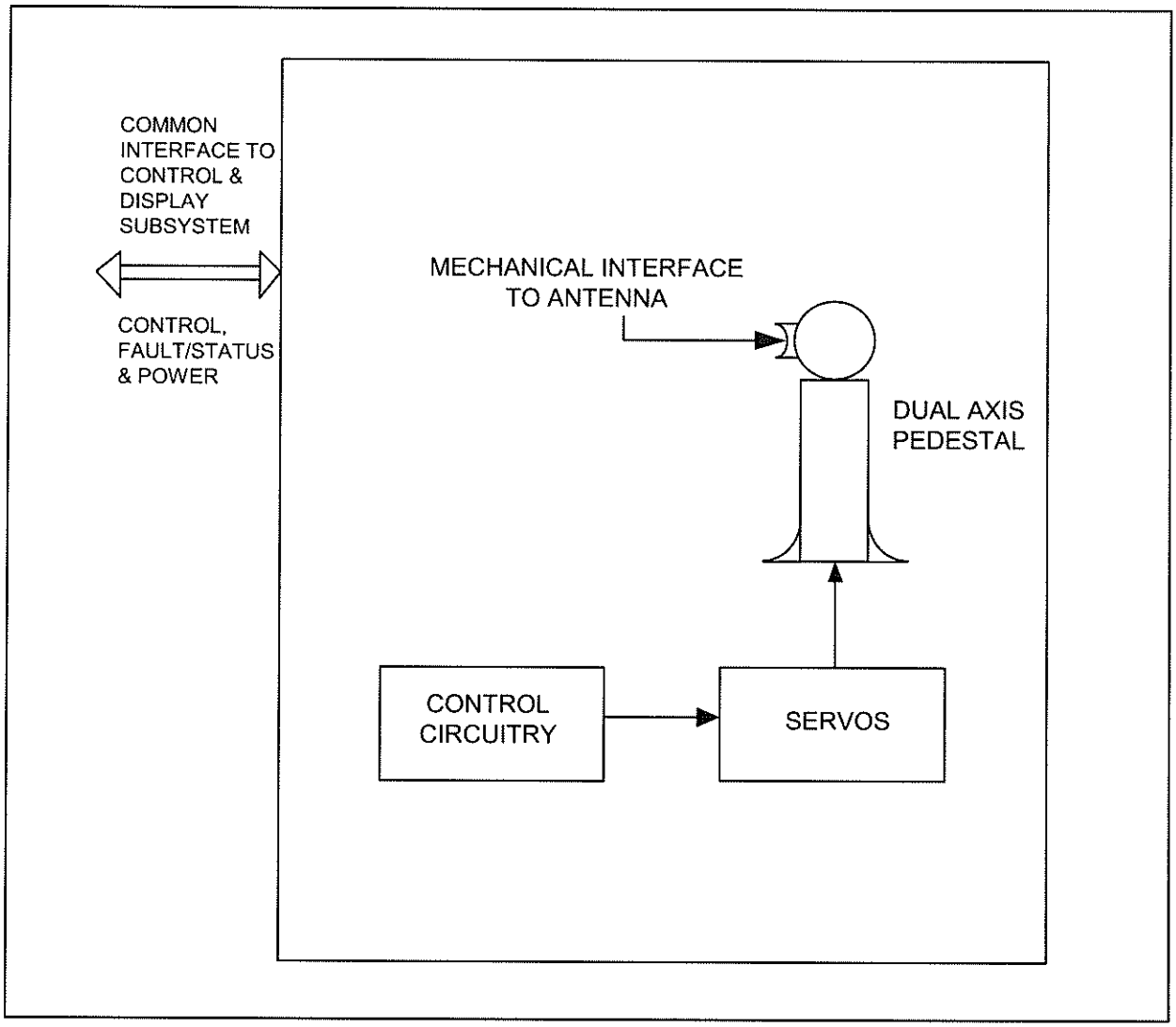


Figure 3-4 Antenna Beam Pointing Subsystem

3.6.2 Pedestal Alignment

Each pedestal shall provide a means for adjustment, allowing the alignment of the pedestal axes for bearing offset. The elevation and azimuth axis adjustments shall not require special equipment or disassembly.

3.6.3 Position Accuracy

The position accuracy is the static error in the angular position of the turntable, about the axis of rotation, relative to that position indicated by the electrical output of the associated transducer. The Root Sum Squared (RSS) 1 sigma error shall be a maximum of 0.045°.

3.6.4 Servo System

The TRES System shall be capable of tracking an aircraft flying at an elevation of 1500 feet, a range of 1500 feet, and a velocity of 750 feet per second. The input to the Antenna Positioning Subsystem is updated every 100ms with the predicted position of the aircraft at the time of the next position update. The antenna shall point to the new position in the 1dB (0.8 power) beam width of the antenna within 100ms of the position input.

3.6.5 Boresight Telescope

A boresight telescope shall be mounted on each TRES antenna to permit AZ and EL alignment of the antenna by using optical alignment (boresighting) procedures. The boresight telescope shall be optically collimated with the RF beam.

3.6.6 Video Camera Interface

The Video Camera Interface (VCI) shall attach to the TRES pedestal in a manner that allows full pedestal operation (rotation and tilt) without interruption of signal or damage to the power and video cabling.

3.6.6.1 Mechanical

The VCI shall be integral to the TRES antenna pedestal to allow easy installation and antenna boresight alignment of a video camera and its environmental enclosure. The VCI shall be mounted so that when a video camera and its enclosure are installed they do not interfere with the boresight telescope. The structure of the VCI shall allow video cameras of older (designs as might be found in government inventory) as well as the newer CCD type cameras to be used. The VCI shall be designed to support a total weight of 125 pounds and a total length of four feet.

3.7 Diesel Generator

The diesel generator shall be one remote controlled diesel powered generator. The diesel generator shall be designed to operate on an eight (8) by eight (8) foot pad. The generator shall include provisions to be secured to the pad. Stowage of control and power cables shall be provided at the diesel generator within the footprint specified above. The cables shall allow a minimum of seventy-five feet of separation between the TRES and generator. The diesel generator shall operate in the environmental conditions specified in Section 3.9.

The diesel generator fuel tank, oil reservoir, and coolant reservoir (if liquid cooled) shall have enough capacity for a minimum of 40 hours of full TRES operation. The fuel tank shall have drainage capability. Fuel lines shall be protected from puncture if an external fuel tank is required. The diesel generator shall have a runtime meter that displays operation time in hours. The diesel generator shall also have fuel level, engine temperature, and oil pressure gauges with low/high level warning lamps. The generator system shall shutdown prior to suffering damage for any reason and the TRES will report a generator fault and be disconnected from the generator.

3.7.1 Diesel Generator Power Output

Diesel generator power output shall be 120VAC, 3 phase, 60Hz. Power requirements of any TRES threat configuration specified shall not exceed 67% of generator rating at 10,000 feet Mean Sea Level (MSL). The diesel generator shall be capable of operating from sea level to 10,000 feet MSL at rated output levels. All TRES related equipment shall be included in the 67% calculation. This shall include the capability to recharge any battery system supplied with any TRES during operation. Two single phase 120VAC, 60Hz, service outlets shall be provided on both the diesel generator and TRES for test equipment power. Minimum service outlet power shall be 1150 watts and shall be included in the generator 67% calculation. Generator power output shall be inhibited after starting until voltage and frequency are stabilized to within ±5% of rating. All electrical subsystems on the TRES shall be disconnected from power prior to generator shutdown.

3.7.2 Data Link Battery Backup

The TRES data link shall have a battery backup system for each TRES System operating with the diesel generator that allows the TRES System to maintain the data link only mode. TRES Systems operating with the power distribution system shall maintain the data link receive only status without the battery backup system. The battery backup necessary to keep the TRES operating in the data link mode shall be sufficient to permit a minimum of 350 hours of continuous data link receive mode operation, with enough reserve power to start the generator system at the end of the 350 hour interval.

3.8 Enclosure(s)

A complete TRES System shall have a physical footprint no larger than 8 feet wide. As an option, the TRES shall have leveling jacks. The assembled TRES shall be capable of being lifted by forklift, or by crane when a sling is used.

The TRES System shall be designed on a platform with the transmitters on the pedestal mount, where practical, to minimize RF losses. The TRES shall be designed with particular emphasis on ease of access for maintainability and for environmental hardening. The pedestal shall be securely mounted. The Waveguide Pressurization and Dehydration Subsystem shall be isolated to minimize vibration transfer to other subsystems.

3.8.1 Maintenance Lighting

Flood lights shall be placed on each TRES, as an option, to facilitate operation and maintenance during periods of darkness. The floodlights shall provide sufficient illumination to read all placards and indicators. As an option, a trouble light with a retractable cord 30 feet in length shall be placed at the TRES to facilitate maintenance during periods of darkness. The trouble lamp shall have an attachment hook and shall be stowed in an enclosure. The trouble lamp shall be designed with a strain relieved power cord that is not removable from the enclosure.

3.8.2 Fire Extinguisher

As an option, each TRES shall contain an externally mounted fire extinguisher. The fire extinguisher shall be mounted in a red, labeled, NEMA 4X, glassed enclosure with

a captive break-loose handle. The fire extinguisher shall be a halon type rated 2A: 40-BC, marine type, United States Coast Guard approved.

3.9 Environmental

The TRES System and diesel generator will be required to interface with the environment under harsh conditions. These conditions will include extended periods of rain, snow, heat, and cold. The deployment environments will also vary from deserts to mountains and sea shores to ocean platforms. Particular emphasis to environmental hardening shall be placed upon the TRES System design to achieve reliability in the field environment. The TRES System, diesel generator, and all equipment shall not suffer any electrical, mechanical or other damage when subjected to the conditions specified herein, which include the effects of solar radiation.

3.9.1 Altitude

The equipment shall be operable without degradation in specified performance at altitudes up to 10,000 feet MSL.

3.9.2 Temperature Operating

The equipment shall be operable without degradation from minus 20° Celsius (-20°C) to plus 55° Celsius (+55°C).

3.9.3 Temperature Non-Operating

The equipment shall be capable of withstanding minus 40° Celsius (-40°C) to plus 65° Celsius (+65°C) while in a non-operating condition.

3.9.4 Humidity

The equipment shall be operable without degradation in specified performance and shall sustain no physical damage, during and after prolonged exposure to 95% humidity at +30°C, including condensation caused by temperature changes.

3.9.5 Rain

The equipment shall be operable without degradation in specified performance and shall sustain no physical damage during periods of heavy precipitation (2 inches/hour) with winds as specified in Section 3.9.10.

3.9.6 Dust

The equipment shall withstand, in both operating and non-operating condition, exposure to dust particles with wind speeds of 75 knots.

3.9.7 Salt Fog

The equipment shall be resistant to the corrosive effects of a salt-fog atmosphere.

3.9.8 Fungus

The equipment, in the assembled and ready for delivery condition, shall provide no nutrients in material, coating, or contaminant form to support fungal growth.

3.9.9 Icing

The TRES shall be operable and sustain no physical damage when subjected to icing accumulations of 1/4 inch radial clear ice with a specific gravity of 0.85. Continued operation when subjected to icing accumulations of 1/2 inch radial clear ice shall be required, however, degraded performance is allowed.

3.9.10 Wind

The TRES shall be capable of withstanding, with or without icing, winds of 50 knots and gusts of 75 knots while operating, and wind speeds of 75 knots with gusts to 100 knots while not operating.

4.0 Product Assurance

4.1 Reliability

The System shall meet the reliability requirement, MIL-STD-756B, under the environment specified in Section 3.9. Normal operation will be from 0800 to 1600, five days a week.

4.1.1 Mean Time Between Failure

Mean Time Between Failure (MTBF) is defined as cumulative operation time divided by the number of failures occurring within the time period. Reliability type failures are chargeable failures as defined in Paragraph 5.6.2 of MIL-STD-781D, based on a basic reliability model as defined by task 101 of MIL-STD-785B. The cumulative time basis is the total operating (on) hours, including standby and active (radiate) states. Any exceptions to this general rule of chargeable failures are stated under each requirement.

4.1.1.1 Transmitters

The MTBF for each transmitter shall meet or exceed 6000 hours when operating in the environment identified in Section 3.9 (Excluding the replacement of the RF output tubes).

4.1.1.2 TRES

The TRES, excluding the transmitters, but including all other TRES System equipment shall have a minimum MTBF of 3000 hours when operating in the environment identified in Section 3.9.

4.2 Maintainability

The TRES System shall be designed to maximize maintainability, IAW MIL-STD-470A. Troubleshooting and replacement shall be to the circuit card level.

4.2.1 Preventive Maintenance Requirements

As a goal, the TRES Preventive Maintenance (PM) period shall not exceed 45 minutes. As an additional goal, PM periods shall be limited to once per month or 60 hours of system operation. Specific attention shall be paid to minimizing and simplifying maintenance requirements. PM procedures and intervals shall be documented.

4.2.2 Design and Construction

System design shall incorporate the methods and materials specified herein. Deviations shall be authorized only on written approval from Loral.

4.3 Materials, Processes, and Parts

4.3.1 Electrical Interconnection Welds

The welds of electrical and electronic interconnections and part leads shall be IAW MIL-STD-454K, Requirement 24.

4.3.2 Grounding, Bonding and Shielding

Grounding, bonding and shielding shall be performed IAW MIL-STD-454K, Requirement 74. Particular attention shall be paid to avoid ground loops.

4.3.3 Arc-Resistant Material

Material used for insulation of electrical power circuits, where arcing is possible, (connector inserts, relays, circuit breakers, etcetera) shall meet MIL-STD-454K, Requirement 26.

4.3.4 Paint and Color

Surfaces shall be finished IAW MIL-F-14072C. The specific exterior paint colors and schemes required are deployment based and shall be defined by Loral Statements of Work (SOW).

4.3.5 Corrosion and Deterioration

Selection of all finishes shall be IAW MIL-F-14072C. The inside surfaces of all exposed surfaces shall be treated as Type 1 surface areas IAW MIL-F-14072C.

4.3.6 Dissimilar Metals

Selection and protection of dissimilar metal combinations shall be made IAW MIL-STD-454K, Requirement 16.

4.3.7 Batteries

Selection and application of batteries shall be IAW MIL-STD-454K, Requirement 27.

4.3.8 External Connectors

All electrical connectors shall be selected IAW MIL-STD-454K, Requirement 10.

4.3.9 Soldering

Soldering shall be IAW MIL-STD-454K Requirements 5 and 9, independent of the weapons specification requirement.

4.3.10 Wirewrap

Wirewrap shall not be used.

4.3.11 Drainage and Moisture Pockets

Pockets, wells, and traps, in which water or condensation could collect, shall be avoided, IAW MIL-STD-454K Requirement 31. Provisions for drainage shall be made where moisture pockets can not be avoided.

4.3.12 Electrical/Electronic Part Selection

The following criteria shall be used for electronic part selection.

a. Components shall be selected for reliability, environmental hardness, and performance characteristics. Commercial component usage is encouraged where it can be demonstrated that these requirements can be met. Where ambiguities exist, components shall be selected IAW the individual electrical/electronic part requirements of MIL-STD-454K.

b. All micro devices shall have a minimum of two sources.

c. Custom designed integrated circuits shall not be used.

d. Card connectors shall be two piece pin type. Plain edge connector types shall not be used. Card restraints shall be used on all printed circuit cards.

4.3.13 Internal Wiring

Internal wiring practices shall be IAW MIL-STD-454K, Requirement 69. Copper wire shall be used throughout the TRES. Particular attention to vibration resistance shall be employed, including strain relief on all wiring and cables.

4.3.14 External Cables

External cables shall be selected from rodent resistant material.

4.3.15 Structure Welds

Structure welds shall meet the requirements of MIL-STD-454K, Requirement 13.

4.3.16 Electromagnetic Radiation

The System shall be designed to be blanked in AZ sectors due to the close proximity of other TRES Systems at the deployment site. The TRES shall meet requirements of Parts 1 and 4 of MIL-STD-461B.

4.3.17 Nameplates and Product Marking

Identification and marking shall be IAW MIL-STD-454K, Requirement 67.

4.3.18 Workmanship

The equipment shall be manufactured and assembled IAW MIL-STD-454K, Requirement 9 .

4.3.19 Interchangeability

The System shall meet the interchangeability and replaceability of MIL-STD-454K, Requirement 7.

4.4 Safety

System safety provisions shall be IAW MIL-STD-454K, Requirement 1 and MIL-STD-882B.

4.4.1 System Safety

The subcontractor shall perform the System Safety Tasks. A System Safety capability shall be provided that provides a warning that a TRES pedestal is energized, and a separate warning that a TRES transmitter is radiating. A flashing blue light shall go on when the pedestal is energized, a flashing red light shall go on when a transmitter is radiating. An extra outlet shall be provided so that remote flashing lights can be attached. There shall be a capability to place the TRES in a safe-mode that permits a safe approach to the TRES. This safe-mode shall be key switch operated. Enough cable shall be provided to ensure that the safe mode control system is out of the Radiation Hazard (RADHAZ) zone. Independent of RADHAZ calculations a minimum of three hundred (300) feet of cable shall be provided with the safe mode control system.

4.4.2 Radiation Hazards

The System shall meet the requirements of MIL-STD-454K, Requirement 1 (Radiation Hazards). Local control of the System RF output shall be possible without exceeding safe radiation levels.

4.5 Human Performance/Human Engineering

The principles and criteria of MIL-STD-14072C, as specified herein, shall apply to the System design:

a. Arrangement and Grouping of Controls

b. Accessibility

c. Lubrication

d. Access Openings and Covers (qualitative only)

4.5.1 Adjustments

The number of adjustments contained within the System shall be kept to a minimum, IAW with good engineering practice. Overly sensitive adjustments shall be avoided. All adjustments shall be easily accessible but not located such that the adjustment can be inadvertently altered during System operation.

4.6 Quality Assurance Provisions

4.6.1 Responsibility for Inspection

The subcontractor shall establish and maintain a quality assurance program in accordance with MIL-Q-9858A and DOD-STD-1679. Unless otherwise specified in the contract, the subcontractor is responsible for the performance of all inspection requirements. Loral reserves the right to perform any inspection, or verify any test and inspection records, it deems necessary to ensure the requirements of this specification are met. Except as otherwise specified in the contract, the subcontractor may use their own or any facilities suitable for the performance of the inspection set forth in the specification, where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.6.2 Previous Acceptance or Approval

Previous acceptance or approval of material by Loral shall in no case be construed as a guarantee of the acceptance of the finished product.

5.0 Transportation and Storage

5.1 Preservation and Packaging

Preservation and packaging will be IAW MIL-STD-129J and the terms of the contract.

6.0 Terms, Abbreviations and Acronyms

AEWTR	Aircrew Electronic Warfare Training Ranges
Attn	Attention
AZ	Azimuth
C	Celsius
CF	Control Facility
CU	Control Unit
EL	Elevation
ERP	Effective Radiated Power
EW	Electronic Warfare
HVPS	High Voltage Power Supply
IAW	In Accordance With
LR	Launch Relay
MA	Missile Alert
MG	Missile Guidance
ML	Missile Launch
MSL	Mean Sea Level
MTBF	Mean Time Between Failure
NAWCWPNS	Naval Air Warfare Center-Weapons Division
PM	Preventive Maintenance
PRF	Pulse Repetition Frequency
PRI	Pulse Repetition Interval
PW	Pulse Width
RF	Radio Frequency
RSS	Root Sum Squared
SDRL	Subcontractor Data Requirements List
SMA	Subminiature Axial Cable Connector Type
SOW	Statement of Work
T.O.	Technical Orders
TRES	Threat Radar Emitter Simulator
TT	Target Track
VAC	Volt, Alternating Current
VCI	Video Camera Interface
VSWR	Voltage Standing Wave Ratio